

## SUPPLEMENTARY INFORMATION (SI)

### Biodegradation of Vulcanized SBR: A Comparison between *Bacillus subtilis*, *Pseudomonas aeruginosa* and *Streptomyces* sp.

Mostafa G. Aboelkheir<sup>1</sup>; Priscilla B. Bedor<sup>2</sup>; Selma G. Leite<sup>2</sup>; Kaushik Pal<sup>3</sup>; Romildo D. Toledo<sup>5</sup>; Fernando G. Souza Jr<sup>4,5\*</sup>

<sup>1</sup>.Programa de Engenharia Civil, Universidade São Judas Tadeu, Rua Taquari, 549, São Paulo,  
Brasil

<sup>2</sup>. Escola de Química, Centro de Tecnologia - Cidade Universitária, Av. Horacio Macedo, 2030,  
Bloco E. Universidade Federal de Rio de Janeiro, Brasil, Zip code 21941-909

<sup>3</sup>. Bharath University, BIHER Research Park, Selaiyur, Chennai 600073, Tamil Nadu, India

<sup>4</sup>. Instituto de Macromoléculas, Centro de Tecnologia - Cidade Universitária, Av. Horacio  
Macedo, 2030, Bloco J. Universidade Federal de Rio de Janeiro, Brasil, Zip code 21941-909

<sup>5</sup>.Programa de Engenharia Civil, COPPE, Centro de Tecnologia-Cidade Universitária, Av.  
Horacio Macedo, 2030, Bloco I. Universidade Federal de Rio de Janeiro, Brasil, Zip code  
21941-914

e-mail: [fgsj@ufrj.br](mailto:fgsj@ufrj.br)

Supplementary Table 1 EDS Index of carbon and sulfur elemental analysis presents in v-SBR before and after the contact with three different types of bacteria.

Sample	Element	Weight %	Atomic %	Compound %	Sulfur/Carbon Ratio (%)
Control	C	24.65	31.54	90.33	1.94
	S	0.48	0.23	1.19	
<i>Bacillus subtilis</i>	C	24.86	31.82	91.10	0.47
	S	0.12	0.06	0.29	
<i>Pseudomonas aeruginosa</i>	C	25.25	31.93	92.53	0.64
	S	0.16	0.08	0.40	
<i>Streptomyces</i> sp.	C	25.17	31.78	92.21	0.45
	S	0.11	0.05	0.28	

Supplementary Table 2 Index of vibration modes of the FTIR spectra of v-SBR before and after the contact with bacteria.

Characteristic Band Number	Band Assignments
1	C-H stretching bond in CH <sub>2</sub> and CH <sub>3</sub> groups
2	
3	C=C asymmetric and symmetric stretching in the aromatic ring skeleton
4	
5	S=O & SO <sub>2</sub> conjugated stretching
6	
7	Styrene (cis-1,4-unit, 1,2-unit, and trans-1,4-unit)
8	C-H out-of-plane bend
9	ring out-of-plane C-H bending
10	Styrene (trans-1,4-unit)
Extra Band (1735 cm <sup>-1</sup> )	C=O stretching from residual stearic acid

Supplementary Table 3 Thermal decomposition characteristics of v-SBR before and after the contact with the bacteria during 1 and 4 weeks estimated from TGA data.

Sample	T-2% (C°)	T-5% (C°)	T-10% (C°)	T-50% (C°)	T-85% (C°)	Inorganic Residue (%)
Control 1	317	352	384	452	403	6.53
Control 4	320	353	384	453	614	11.94
<i>Bacillus subtilis</i> 1	313	355	383	452	398	4.12
<i>Bacillus subtilis</i> 4	320	358	384	454	484	6.27
<i>Pseudomonas aeruginosa</i> 1	311	352	381	451	396	5.39
<i>Pseudomonas aeruginosa</i> 4	299	351	382	451	397	6.46
<i>Streptomyces</i> sp. 1	310	351	386	452	404	4.97
<i>Streptomyces</i> sp. 4	308	351	381	452	482	5.66

Supplementary Table 4 Carbon and Sulfur Mass Balance of v-SBR converted to CO<sub>2</sub> and SO<sub>2</sub> before and after the contact with the bacteria during 1 and 4 weeks.

Sample	Total Carbon (%)	Sulfur (%)	Carbon loss (%)
Control 1	73.64	1.83	0
Control 4	73.45	1.80	0
<i>Bacillus subtilis</i> 1	66.90	1.71	9.15
<i>Bacillus subtilis</i> 4	61.63	1.68	16.09
<i>Pseudomonas aeruginosa</i> 1	69.24	1.80	5.97
<i>Pseudomonas aeruginosa</i> 4	61.12	1.78	16.79
<i>Streptomyces</i> sp. 1	70.29	1.86	4.55
<i>Streptomyces</i> sp. 4	60.13	1.77	18.13